

By Facsimile

Amendments to the Specification

Kindly, substitute the following paragraph for that starting on line 28 of page 7 and continuing to line 23 of page 9 of the specification:

The numbers shown in the figure identify each of the pixel groups and appear as subscript labels in the following discussion. In an image having any particular brightness values at its pixels, the mean brightness values of the six groups surrounding the central group may be represented as a vector  $B = (B_1, B_2, B_3, B_4, B_5, B_6)^T$ , where the superscript T denotes a transpose operation that converts a row matrix to a column matrix. A Local Radial Angular (LORA) transform  $L \rightarrow c$  is defined as  $c = RB$ , where  $c = (c_1, c_2, c_3, c_4, c_5, c_6)^T$  is a vector of transformation coefficients. R is a six by six square matrix whose elements are formed according to:

$$R_{km} = (1/\sqrt{6}) \parallel \exp[i(k-1)(m-1)\pi/3] \parallel, (k, m = 1, 2 \dots 6)$$

where  $i$  is the imaginary unity (i.e., the square root of  $-1$ ),  $\pi$  is the ratio of the circumference to the diameter of a circle, and  $k$  and  $m$  are the row and column indices of the matrix elements. The explicit form of  $c_3$  is given by:

$$c_3 = (0.5/\sqrt{6}) (2B_1 - B_2 - B_3 + 2B_4 - B_5 - B_6) + i (0.5/\sqrt{2}) (B_2 - B_3 + B_5 - B_6)$$

so that the real and imaginary components of  $c_3$  are given, respectively, by:

$$\text{Real}(c_3) = (0.5/\sqrt{6}) (2B_1 - B_2 - B_3 + 2B_4 - B_5 - B_6)$$

$$\text{Imaginary}(c_3) = (0.5/\sqrt{2}) (B_2 - B_3 + B_5 - B_6)$$

The magnitude of the modulus  $|c_3|$  of the transformation coefficient  $c_3$  has been found to be an indicator of the presence of a line-like feature in the image lying under the hexon superimposed over the image. There are two values of  $|c_3|$  corresponding to the orientations 1 and 2 shown in Figure 1. These separate values  $|c_{13}|$  and  $|c_{23}|$  may be combined into a

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single value  $|c_3|$ , for instance by taking the larger of the two, taking the square root of the sum of the squares, weighted averages, and the like. The magnitude of  $|c_3|$  can be considered the strength of a line response in the image. It is also possible to define a different hexon response,  $\delta_3$ , which is a measure of the line purity. This hexon response quantity is defined as:

$$\delta_3 = 2 |c_3|^2 / \sum_{k=2}^{k=6} |c_k|^2$$

Other definitions involving weighted functions of the coefficients  $c_k$  are also possible. Since coefficients other than  $c_3$  respond to image features that are not lines,  $\delta_3$  is a measure of the degree to which the  $c_3$  response represents a line. There are separate values,  $\delta_{13}$  and  $\delta_{23}$ , of this measure for hexon orientation 1 and hexon orientation 2, respectively (see Figure 1). These may be combined into a single value of  $\delta_3$  by any convenient means, for instance by using the larger value. The  $c_3$  coefficient responds to lines that are both dark and light with respect to the background upon which they lie and by default both types of lines are detected. However, it is also possible to selectively detect only light lines or only dark lines. This may be achieved in various ways. For example, the mean brightness or channel value at the quasi-pixels lying closest to the line may be compared to the value of  $c_1/\sqrt{6}$ . Alternatively, the lightness or darkness of a line may be estimated from the real and imaginary parts of the  $c_3$  coefficient by comparison to thresholds  $T_1$  and  $T_2$  according to the following logic:

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if |Imaginary(c3) / Real(c3)| ≤ T1 and Real(c3) > T2 then Light
if |Imaginary(c3) / Real(c3)| > T1 and Real(c3) < T2 then Light
if |Imaginary(c3) / Real(c3)| ≤ T1 and Real(c3) < T2 then Dark
if |Imaginary(c3) / Real(c3)| > T1 and Real(c3) > T2 then Dark

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While the value of  $T_1$  depends on the detailed geometry of the hexon, a preferred value of the threshold  $T_1$  is from greater than about 0 to less than about 0.57. An especially preferred value is about 0.07 to about 0.41, with a most especially preferred value of about 0.3. The preferred value of  $T_2$  is about 0. In this way either light or dark lines may be separately detected.